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Measurement of Λ_c+ polarization with an amplitude analysis of Λ_c+⟶p K- π+ to obtain the magnetic dipole moment of charmed baryons

In this works we aim at using LHCb data to measure the polarization of $^{+}_{c}$ through the three-body resonant decay $^{+}_{c}\to pK^{-+}$. This is part of a long-term project intented to measure the magnetic and electric dipole moments (MDM/EDM) of charmed baryons ($^{+}_{c}$ and $^{+}_{c}$).

The experimental method consists in measuring the polarization vector of the incoming particle and the precession angle after the particle travelled through a magnetic field. From that information we can infer the dipole moment of the baryon. This is challenging since charmed baryons have a very short lifetime, hence an intense magnetic field is needed to make the precession happen before the decay.
The proposal is to direct protons of the LHC or SPS beam towards a first crystal (target-converter) to produce the baryons. Then those baryons will be captured in a second crystal (bending crystal) which produce an effective magnetic field strong enough to make them precess.

In order to measure the precession angle, we need to know the polarization of the baryons before entering the bending crystal, and here is where LHCb data play a crucial role. Thanks to the SMOG system (System for Measuring Overlap with Gas) we can inject tiny quantities of gas in the VErtex LOcator transforming LHCb into a fixed target experiment. This is unique at the LHC and it allows to reproduce the production conditions of the baryons before the bending crystal.

The measurement of $^{+}_{c}$ polarization is performed using the pNe data sample @69 GeV recorded in 2017. This is done via a 5-dimensional amplitude fit. The model used for the fit is based on the helicity amplitudes formalism, it is first tuned on the high statistics pp data sample available and then used to perform the measurement on the p-gas data sample.

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